

Concept of lower limb prosthetics and their recent technological evolution

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Keywords: Lower limb prosthetics; Lower limb amputation

Aim.— To describe the basic concepts of lower limb prosthetics (socket, joints and feet) and their recent technological evolution. Prosthetics for major trans-pelvic amputation are out of the scope of this review.

Methods/Application.— An overview of the technical characteristics of all available components is proposed. We then consider the different medico-technical responses. Based on the example of energy-storing feet, we describe the evolution of the reimbursement regulations which rely on independent technological assessment (by the CERAH), and on functional analysis of the patients situations which determine the medical indications and prescriptions.

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Under limb amputation for people with mobility 1 or 2; choice of fitting with prosthetic

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Introduction.— Maintaining or restoring the autonomy of patients with low mobility has always been our main objective to allow them to go and come from their home.

Population breakdown and study method.— We carried out a preliminary study on 26 lower-limb amputees; on average, patients were 72 years old, mobility level (Interbor scale) was 1 or 2. We first fitted them with a tubular shank, followed by a prosthesis consisting of two vertical carbon shanks, the Clever Bone (CB) prosthesis.

Reasons for amputations were: arterial diabetic traumatic tumour, congenital. Amputation levels were: trans-tibial, trans-femoral, bilateral trans-tibial, mixed trans-femoral.

After an initial rehabilitation period, the patients had a first functional assessment using tests that had been validated in rehabilitation medicine.

The tubular shank system was replaced by a CB prosthesis. The patients underwent their second assessment ten days later. Finally, in order to be totally objective, the patients went back to the tubular shank system and had an assessment eight days later.

The three tests were scored and the results were compared for each patient. The aim was to establish the most effective type of prosthesis for each patient, keeping the same socket and using the patients as their own control.

Results and discussion.— Out of the 26 patients, we recorded two with higher performance scores for the tubular shank system. This can be explained by better balance and a lower level of destabilisation when walking. Five out of 26 had virtually identical performance scores with either the tubular shank system or CB. Nineteen patients were between 15% and 62% more effective with the CB system.

Functional improvement for all of these 19 patients was verified by the tests mentioned above: get-up-and-go test, 6-minute walk test, walking sideways, walking a range of steps.

Conclusion.— Improving the functional options for an ageing French population by finding the best prosthesis improves patients' health, reduces the cost for funding bodies and is a duty of functional rehabilitation teams.

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Outcome of trans-tibial amputees equipped with energy-storing foot in Nord-Pas de Calais and Picardie

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Keywords: Transtibial amputee outcome; Energy-storing foot; Prosthetic profile of the amputee; Walking distance

Objective.— Analysis of factors related to locomotor performance level (LPL) of trans-tibial amputees equipped with energy-storing foot.

Methods.— “Prosthetic Profile of the Amputee” questionnaire (Gauthier-Gagnon, 1994) was sent to all subjects aged between 30 and 65 years with unilateral trans-tibial amputation and fitted with an energy-storing foot, living in Nord-Pas de Calais and Picardie. Descriptive analysis of functioning and contextual factors according to the international classification of functioning and disability (ICF). Bivariate and multivariate analysis to determine, within each dimension of the ICF, the factors that are related to high LPL. High LPL was defined by permanent prosthesis use for mobility outside, with no limitation of walking distance and without any walking assisting device.

Results.— 76 questionnaires were analyzed among 295 sent. 51% had a high LPL and 32% had a limited walking distance. High LPL was predicted: at 68% in “structures and functions” dimension by the absence of leg oedema (OR = 9.84 [1.85; 52.27]), the absence of phantom limb pain (OR = 7.66 [1.39; 42.27]) and the absence of stump wound (OR = 3.96 [1.31; 11.95]); it was predicted at 72.3% in “activity” dimension by the ability to walk without human aid during bad weather (OR = 36 [9.65; 136.16]); at 76.8% in “participation” dimension by the employment (OR = 5.90 [1.86; 18.66]), sport practice (OR = 5.88 [1.81; 19.12]) and active leisure practice (OR = 4.18 [1.79; 14.86]); and at 36% in “contextual factors” dimension by the good acceptance of amputation by the family (OR = 6 [1.72; 30.72]).

Discussion.— In order to maintain a high NPL, there is a need to prevent cardiovascular impairments and to enhance balance capacity. Readaptative follow-up is necessary to readjust physical and human environment to the deterioration of locomotor performance.

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What are the criteria for choosing a prosthetic knee for the trans-femoral amputee? Proposals for a decision pathway

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Keywords: Prosthetic knee; Decision pathway

For the trans-femoral amputee, the two main requirements in the choice of prosthetic knee are safety and mobility (two requirements sometimes opposing). These two requisites will be subject to the characteristics of the knee itself and the entire prosthetic process.

The functional goals of the patient's needs may be assessed on the basis of the person's activity profile (LL-0 to LL-4) according to the INTERBOR nomenclature based on the AOPA classification (American Orthotic and Prosthetic Association) and the ICF (International Classification of Functioning).

The technical possibilities of prosthetic knees are diverse and varied: locking knee, open monocentric or polycentric knee, knee with hydraulic and/or pneumatic assistance, microprocessor-assisted knee.

Our proposal is to set up a decision pathway in order to use the technology available to satisfy the patient's needs as best as we can.

The choice of prosthetic knee must be the subject of a medical and paramedical consensus during a medical and technical multidisciplinary consultation, following approval of a specific rehabilitation procedure.

Further reading